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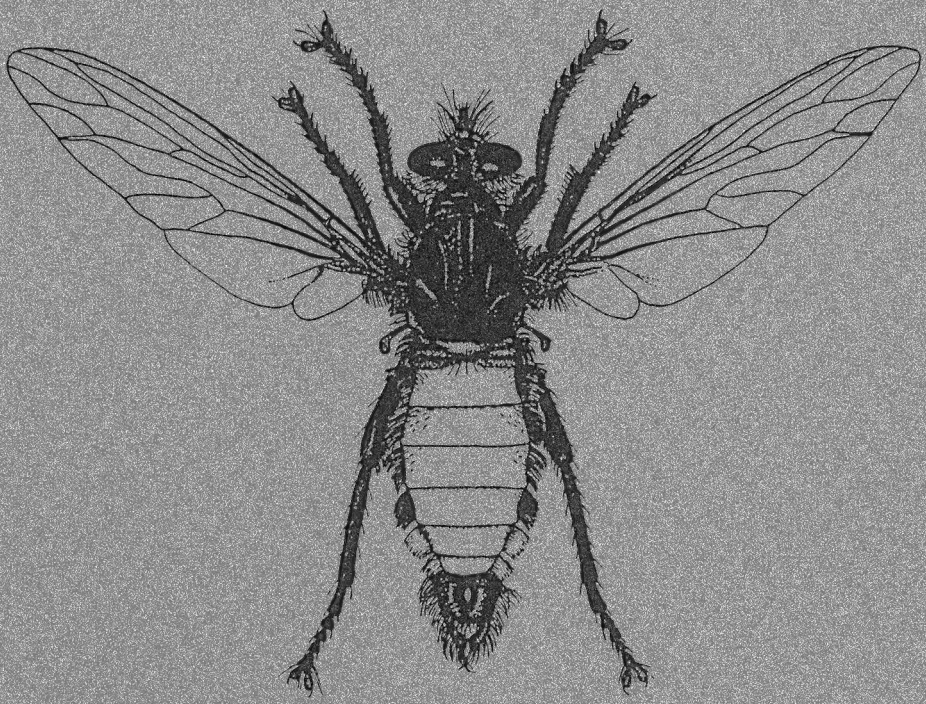

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Cover: The very large and strong-flying robberfly *Blepharotes coriarius* Wiedemann is widespread across eastern Australia. *Blepharotes* contains six described and a similar number of undescribed species, restricted to Australia and New Guinea. They are easily recognised by their flat, usually yellow or orange abdomens, that bear dense, lateral tufts of hairs. From an original drawing by Geoff Thompson.

THE VANUATU SUBSPECIES OF *PAPILIO FUSCUS* GOEZE (LEPIDOPTERA: PAPILIONIDAE)

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Abstract

Both sexes of *Papilio fuscus nomus* Gabriel are illustrated for the first time. The distribution of *P. fuscus* Goeze in the islands of Vanuatu is discussed and brief biogeographical observations made regarding the New Hebrides archipelago.

Introduction

The butterflies of Vanuatu are not well documented. Following the Royal Society / Percy Sladen New Hebrides Expedition in 1971, a checklist of the butterflies was published (Gross 1975) which, in addition to reporting expedition findings, collated museum and other records from Vanuatu. Eight years later another list was independently prepared (Samson 1983), based largely on that author's personal observations on several islands. A number of other papers (Smart 1977, Samson 1982, 1984, Ackery *et al.* 1989, Lachlan 1993) have dealt specifically with the systematics of Vanuatu butterflies. This paper deals with the three described subspecies of *Papilio fuscus* Goeze, 1779 from Vanuatu and illustrates the most northerly (coincidentally also the most distinctive) subspecies for the first time.

Systematics

Aside from unconfirmed sightings of *Graphium sarpedon* (L.) from Espiritu Santo and Erromango (Gross 1975), *Papilio fuscus* is the only species of the family Papilionidae known from the islands of Vanuatu. Vanuatu *P. fuscus* populations were first described as *P. hypsicles* by Hewitson (1868), who noted the similarity of the new taxon to *P. canopus* Westwood, 1842 and *P. capaneus* Westwood, 1843. Only a general type locality for *P. hypsicles* was given by Hewitson (1868) (*i.e.* 'New Hebrides'), although it is clear from his illustration and from the specimens themselves, that this is the 'broad-banded' subspecies which occurs on the central islands of the New Hebrides archipelago, from Efaté northwards to the Banks group. Hancock (1985) suggested the type locality was the island of Espiritu Santo.

Gabriel (1936) described (but did not illustrate) four new forms of *Papilio* L. from the Indo-Pacific region, including a new subspecies of *P. fuscus*, *P. f. nomus* Gabriel, from a solitary male taken by Commander J.J. Walker R.N., on Loh Island, one of the Torres group of islands in northern Vanuatu, in September 1900. Primary type material of both *P. f. hypsicles* and *P. f. nomus* are in The Natural History Museum, London (BMNH). Samson (1982) described and illustrated *P. fuscus burgessi* Samson (as a subspecies of *P. canopus*) from the southern islands of Vanuatu and suggested the species was

unknown from the Banks and Torres Island groups of northern Vanuatu. The present locality of the primary type material of *P. f. burgessi* is not known. The male holotype and female allotype were, at the time of publication, in the 'National Butterfly Museum' (Samson 1982), also known as the Saruman Museum and now defunct. The contents of the Saruman Museum were auctioned by Sotheby's in 1983 and the primary types of *P. f. burgessi* comprised lot 884. The purchaser of this lot is not known. Paratypes of *P. f. burgessi* remain in the BMNH and the Bernice P Bishop Museum (BPBM), Honolulu.

Due possibly to the general nature of Gabriel's short paper, and the fact that no further specimens from the Torres Island group were subsequently reported, the presence of *P. f. nomus* in the Torres group has been almost completely overlooked (Gross 1975, Samson 1982, 1983, Hancock 1983a, 1985, D'Abrera 1990 *etc.*). Following Gabriel's original description, the only published reference to *P. f. nomus* the author has been able to find is that of Hancock (1992), who included it (as *Princeps fuscus nomus*) in an annotated list of *P. fuscus* subspecies. Aside from the holotype, the only other specimen of *P. f. nomus* the author has seen in any collection is a second male in the Australian Museum in Sydney (AMS). This specimen bears a coded (numbered) label claiming it came from Tonga and is accompanied by a drawer label suggesting (almost certainly correctly) Vanuatu as a more probable source. No specimens of *P. f. nomus* exist in the Australian National Insect Collection (ANIC), Canberra (Ted Edwards, pers. comm.) or the BPBM (Al Samuelson, pers. comm.).

P. f. hypsicles and *P. f. burgessi* differ from each other primarily in the width of the pale median band, especially on the forewing. In the latter populations this band is narrower and one might expect specimens from north of the range of the former (*i.e.* from Torres), to have a broader band than *P. f. hypsicles*. In fact, the forewing band of *P. f. nomus* is significantly reduced, to a degree where it may be vestigial. This subspecies also lacks the hindwing submarginal series of red spots found in the other two subspecies. A series collected by the present author in August 2000 on Loh Island, the type locality of *P. f. nomus*, confirmed described subspecific characteristics of the holotype. Distribution of Vanuatu *P. fuscus* subspecies is shown in Fig. 1. Both sexes of *P. f. nomus* (Fig. 2) and *P. f. hyspicles* (Fig. 3) are illustrated, together with two male specimens of *P. f. burgessi* (Fig. 4). A female of the last taxon was not available.

Discussion

Hancock (1992) recognised 34 subspecies of *Papilio fuscus*, occurring from Sulawesi in the west to Vanuatu in the east. To these may be added a further two subspecies from the Solomons archipelago, *P. f. relmae* Tennent from New Georgia and *P. f. gyrei* Tennent from Malaita (Tennent 1999).

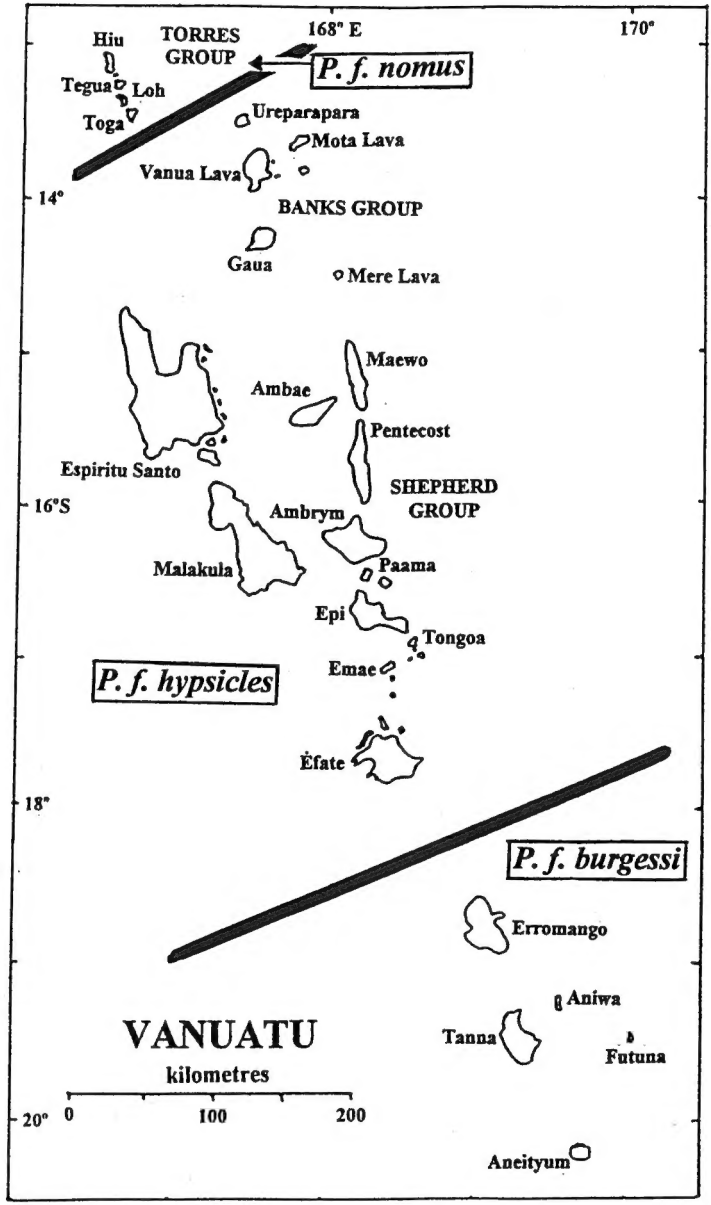

Fig. 1. Distribution of Vanuatu subspecies of *Papilio fuscus*.

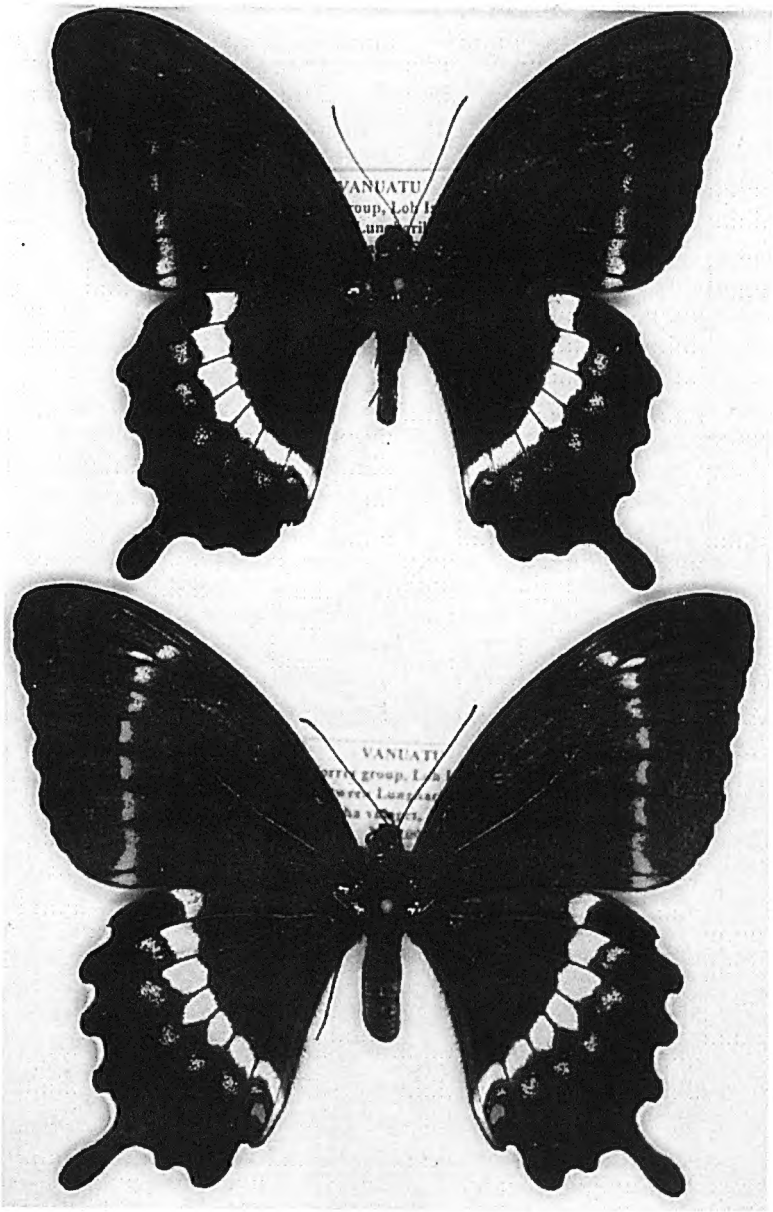

Fig. 2. *Papilio fuscus nomus*, male and female (Loh Island, Torres group).

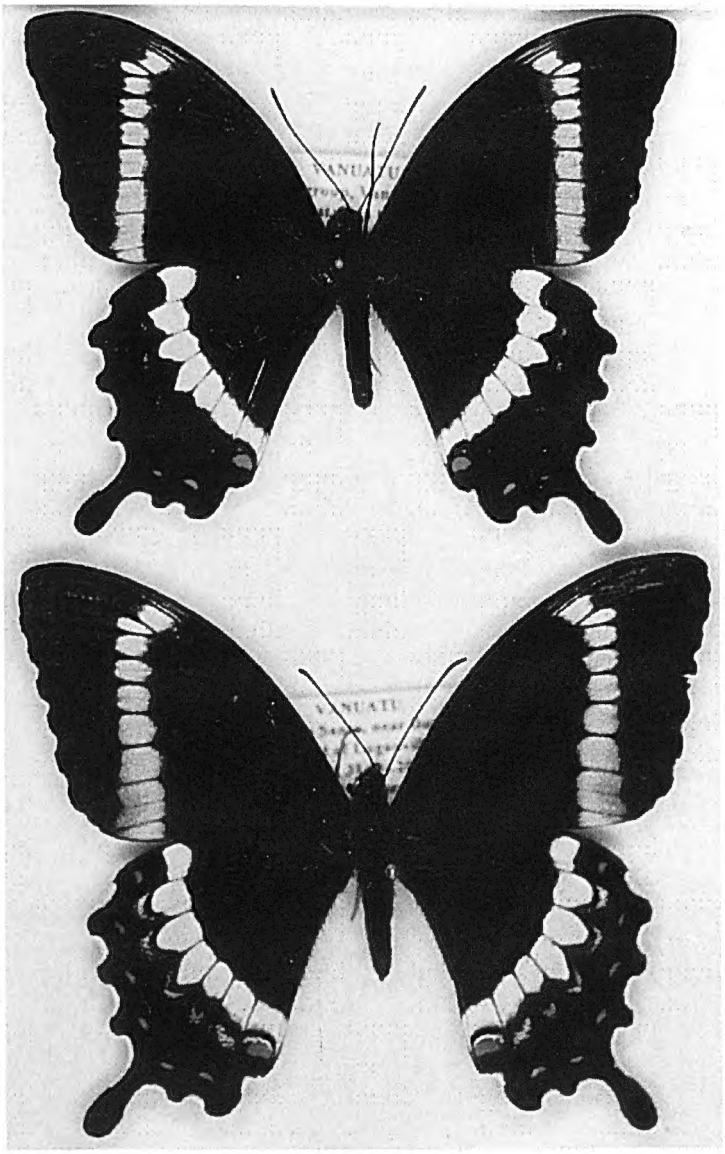

Fig. 3. *Papilio fuscus hypsicles*, male (Vanua Lava, Banks group) and female (Espiritu Santo).

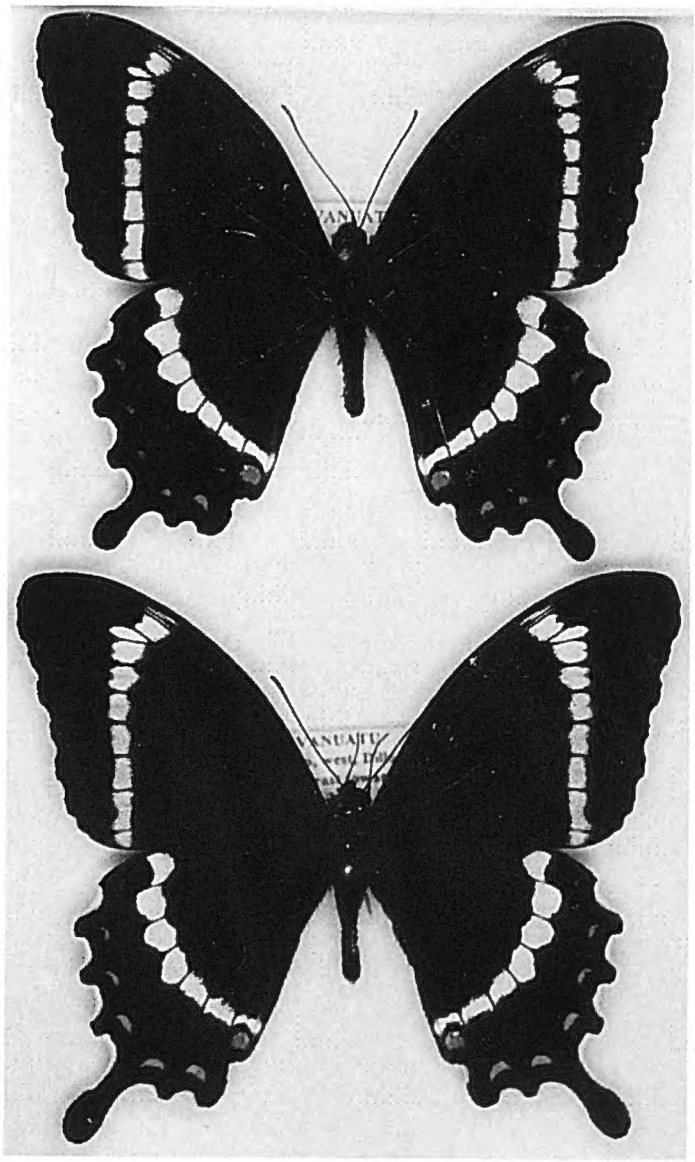

Fig. 4. *Papilio fuscus burgessi*, males (Erromango).

Vanuatu populations mark the most easterly extension of the range of the species and it is considered likely that *P. fuscus* arrived (probably from Australia, but possibly from San Cristobal) first on one of the central islands of Vanuatu, before spreading south (where *P. f. burgessi*, with a less broad median band evolved) and north to the Torres Islands (where *P. f. nomus*, with a greatly reduced median band evolved).

Biogeographically, there appears to be a line of discontinuity between the islands of Efaté and Erromango and this has been remarked upon previously with regard to the butterflies (Samson 1983, Ackery *et al.* 1989). Cheeseman (1957) suggested that the main islands south of this line (*i.e.* Erromango, Tanna, Aneityum) might have once been part of a single land mass. Recent fieldwork by the author suggests further discontinuity between the Torres Islands and the Banks group to the south east, and between the Torres group and the Santa Cruz group to the north, leaving the Torres in effect a discrete island group, with a significant proportion of taxa quite different from its immediate neighbours. This is currently under investigation.

The Torres group represents the most northerly extension of the 'natural' spread of the genus *Papilio* in the New Hebrides archipelago, which is taken to include the Santa Cruz Islands, politically part of the Solomon Islands. Samson (1979) described *P. bridgei hollinsi* Samson from Nendo, the main island of the Santa Cruz group, but this was synonymised with *P. erskinei* Mathew, 1886 by Hancock (1983b). Tennent (1999) presented evidence to suggest that the specimen on which the description of *P. b. hollinsi* was based was wrongly labelled and was almost certainly from San Cristobal, the most easterly island of the Solomons archipelago. The only *Papilio* species known to occur in the Santa Cruz Islands is *Papilio aegeus* Donovan, 1885, thought to have been accidentally introduced to the islands from Australia (Waterhouse 1932, Hancock 1983b, Tennent 1999).

Acknowledgments

The author thanks Chris Samson (GB-Tonbridge) for discussion concerning the possible whereabouts of the primary types of *P. f. burgessi* and Max Moulds, Australian Museum, Sydney, for the loan of the specimen of *P. f. nomus* described above. Ted Edwards, ANIC, Canberra and Al Samuelson, BPBM, Honolulu, confirmed details of Vanuatu *P. fuscus* holdings.

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A NEW SPECIES OF *IONOLYCE* TOXOPEUS FROM THE SOLOMON ISLANDS (SANTA CRUZ GROUP) AND VANUATU (LEPIDOPTERA: LYCAENIDAE)

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Abstract

Ionolyce lachlani sp. nov. is described from islands of the Santa Cruz group (Solomon Islands) and Vanuatu.

Introduction

The genus *Ionolyce* Toxopeus was first reported as occurring in Vanuatu by Gross (1975) who reported '*Ionolyce* sp. nov.' from the island of Espiritu Santo following the Royal Society / Percy Sladen New Hebrides Expedition of 1971. Samson (1983) subsequently noted a species close *to I. helicon* (C. Felder) from the island of Efaté. A series of both sexes of a species of *Ionolyce* was seen in the collection of Rob Lachlan, Queensland, and a further series of both sexes of the same species was taken by the author on islands of the Santa Cruz group (Solomon Islands) and on several islands of Vanuatu, in 2000. This combined material represents a new taxon.

Ionolyce lachlani sp. nov.

(Figs 1-5)

Types. *Holotype* ♂, SOLOMON ISLANDS: Santa Cruz group, Nendo Island, south-west central, forestry camp, 140-160 m, 28.iv.2000, W.J. Tennent (in The Natural History Museum, London [BMNH]). *Paratypes*: 7 ♂♂, 4 ♀♀, same data as holotype (including ♂ gen. preps BMNH(V) 5970 & 5971); 9 ♂♂, 2 ♀♀, same locality, 29.iii.2000; 1♀, Nendo Island, 0-5 km south of Lata, 60-140 m, 19.iii.2000, W.J. Tennent; 1 ♀, Nendo Island, Lata, 60 m, 14.v.2000, W.J. Tennent; 2 ♂♂, Nendo Island, Lata to Noipe, 60-140 m, 3.v.2000, W.J. Tennent; 1 ♂, same locality, 6.v.2000; 3 ♂♂, 2 ♀♀, same locality, 9.v.2000; 1 ♂, 2 ♀♀, Santa Cruz group, Reef Islands, Lomlom Island, paths and gardens between Otelo and Nganiwo school, SL, 30.iii.2000; 1 ♂, Santa Cruz group, Vanikoro, main island, Lale village, SL, 6.iv.2000, W.J. Tennent (all BMNH). VANUATU: *Paratypes*: 3 ♂♂, 1 ♀, Torres group, Loh Island, between Lunghariki and Rinuha villages, SL-20 m, 3.ix.2000, W.J. Tennent; 1 ♂, same locality, 4.ix.2000 (gen. prep. BMNH(V) 5972); 1 ♂, same locality, 6.ix.2000; 1 ♂, same locality, 7.ix.2000 (gen. prep. BMNH(V) 5973); 1 ♂, same locality, 8.ix.2000; 1 ♂, 1 ♀, Malakula, north-east coast, ca 2-8 km north-west of Lakatoro, 20-60 m, 28.viii.2000, W.J. Tennent (all BMNH); 1 ♂, Torres group, Toga Island, 18.xii.1987, R.B. Lachlan (gen. prep. JT621); 1 ♂, Espirito Santo, Port Olry, 1.i.1988, R.B. Lachlan; 1 ♂, 1 ♀, same locality, 5.i.1988; 1♀, Espirito Santo, Luganville, 15.xii.1987, R.B. Lachlan; 1 ♂, 1 ♀, Espirito Santo, 7 km north east of Luganville, 16.xii.1988, R.B. Lachlan; 2 ♂♂, same locality, 27.xii.1987; 1 ♂, Ambrym, north, Olal, Catholic mission, 5.i.1989, R.B. Lachlan; 2 ♂♂, 1 ♀, same locality, 21.ix.1989 (including ♂ gen. prep. JT622) (all R.B. Lachlan collection).

Description. Male (Figs 1-2) with forewing length 12 mm; resembles *I. helicon* (populations from the Bismarck archipelago); generally smaller; upperside dark purple-blue in fresh specimens, fading to dull brownish blue when worn; upperside scales with 'rough' appearance over much of the wings; wing fringes brown; hindwing tail long, slender, tipped white; underside ground colour more grey than *I. helicon*; hindwing subtornal spot large, suffused iridescent green distally (more extensive than *I. helicon*) and dull orange on other three sides. Underside markings variable, probably indistinguishable from *I. helicon* (underside of *helicon* populations from mainland Australia brown, white lines less prominent).

Male genitalia (Fig. 5) similar to those of *I. helicon*; aedeagus large; valve with ventral spine long, curved (shorter, less curved in *I. helicon*); distal edge significantly indented, forming blunt 'lobe' (distal edge more linear, lobe only slightly defined in *I. helicon*); filamentous spines long, numerous.

Female (Figs 3-4) upperside superficially similar to *I. helicon hyllus* (Waterhouse & Lyell) from mainland Australia; ground colour dark grey (paler and more brown in *I. helicon*); upperside blue darker, more extensive, parameters more clearly defined; hindwing subtornal spot large, submarginal white chevron-shaped markings well developed; underside similar to male; subtornal spot large, prominent.

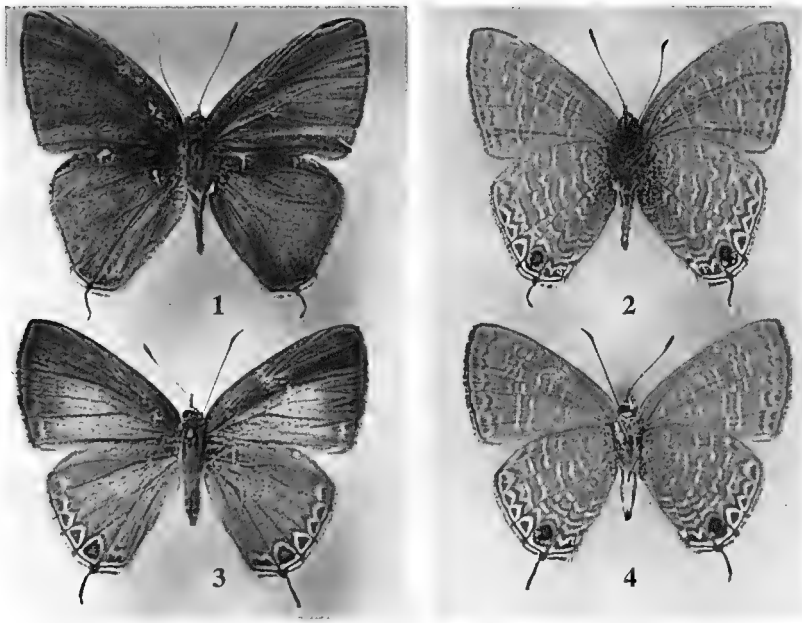
Etymology. This new species is named after Rob Lachlan, Queensland, Australia.

Distribution. Solomon Islands (Reef Islands [Lomlom]; Nendo; Vanikoro) and Vanuatu (Torres Islands [Loh, Toga]; Malakula; Ambrym; Efaté [Samson, 1983]; Espirito Santo).

Discussion

Including *I. lachlani*, the genus *Ionolyce* contains four species, two of which (*I. brunnescens* Tite and *I. selkon* Parsons) are apparently confined to the Solomons archipelago. A third species, *I. helicon*, occurs as eight described subspecies, from Sri Lanka in the west to Papua New Guinea, mainland Australia and the western islands of the Solomons archipelago in the east. The new taxon is the easternmost representative of the genus and is described from the New Hebrides archipelago.

Ionolyce lachlani bears a superficial resemblance to both *I. helicon caracalla* (Waterhouse & Lyell), which occurs in Papua New Guinea and the western Solomons archipelago and *I. helicon hyllus*, which is endemic to northeastern Australia. Although the new taxon shares some morphological features with both these subspecies, differences in the genital armature of the male, combined with morphological differences cited in the description, suggest a new species. The shape of the valve is transitional to *I. brunnescens* (Tite 1963).



Figs 1-4. *Ionolyce lachlani* sp. nov. (1-2) male holotype: (1) upperside, (2) underside; (3-4) female paratype: (3) upperside, (4) underside.

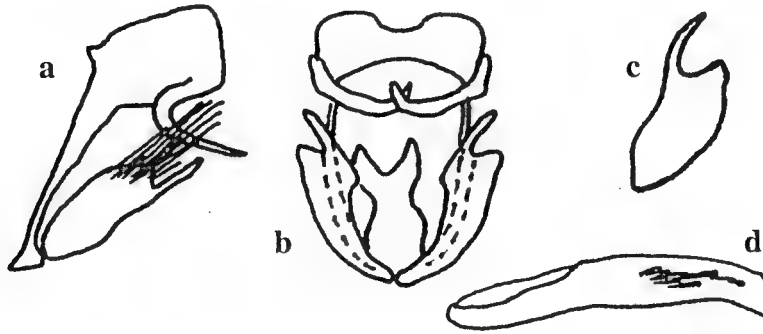


Fig. 5. *Ionolyce lachlani* sp. nov. Male genitalia: (a) genitalia (lateral view, aedeagus removed); (b) genitalia (posterior view); (c) left valva (lateral view, spines removed); (d) aedeagus (lateral view).

Acknowledgments

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NOTES ON *BOCHUS*-GROUP SPECIES OF THE GENUS *JAMIDES* HÜBNER IN THE SANTA CRUZ ISLANDS (SOLOMON ISLANDS), WITH DESCRIPTION OF A NEW SUBSPECIES OF *JAMIDES AMARAUGE* DRUCE (LEPIDOPTERA: LYCAENIDAE)

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Abstract

Jamides amarauge hepworthi subsp. nov., representing a significant easterly extension of the previously known distribution of *J. amarauge* Druce, is described from the Santa Cruz islands of Nendo and Vanikoro (Solomon Islands, Temotu Province). *J. goodenovii* Butler and *J. morphoides* Butler are recorded for the first time from the Solomon Islands. Difficulty in allocating material to species in the *bochus* Stoll species-group is briefly discussed.

Introduction

The type species of *Jamides* Hübner is *J. bochus* (Stoll). The *bochus*-group contains a number of small but visually spectacular species, similar in appearance, characterised in the male by iridescent blue or purple uppersides and dull brown undersides with the usual polyommatine arrangement of fine transverse lines. Females are usually dull in comparison, with the upperside iridescent blue less shining and reduced in extent.

Jamides bochus has a wide Indo-Oriental distribution, from India to Micronesia (Hirowatari 1992). From India to the Moluccas it is the only described species of this group to occur. Three species of the *bochus*-group are recorded from New Guinea and the Bismarck and Solomons archipelagos (Parsons 1998) but further east the *bochus*-group becomes more complex. In the New Hebrides archipelago (Vanuatu) and the Pacific islands (Rarotonga, Cook Islands, Fiji) some 17 names have been applied to *bochus*-group taxa, and in Vanuatu taxonomic assessment of species is hampered by a lack of available material. Hirowatari (1992) recognised 12 species of the *bochus*-group and suggested some synonymy.

Of the *bochus*-group, *J. cephion* Druce (TL [type locality]: Guadalcanal), *J. soemias* Druce (TL: Malaita) and *J. amarauge* Druce (TL: Alu [Shortlands]) are widespread throughout the Solomons archipelago. The remote Santa Cruz group of islands are politically part of the Solomon Islands, although they lie some 400 km east of the Solomons archipelago and have some geographical and faunistic association with the New Hebrides archipelago (*i.e.* Vanuatu) to the south. Aside from the common and widespread *J. celeno* (Cramer) (not part of the *bochus*-group), *J. cephion* was the only *Jamides* species recorded from the Santa Cruz Islands by Samson (1979, 1980), who reported a pair taken on Utupua by Hollins in 1956 (Samson 1979). The male of this pair is almost certainly not *J. cephion* and is similar in all respects to *J. morphoides* Butler (TL: Vanuatu: Montague Island).

The present author observed a *Jamides* species, assumed to be *J. cephion*, quite commonly on the main Santa Cruz island of Nendo, in October 1997 but, on a subsequent visit from March to July 2000, noted a number of apparently different *bochus*-group species. In view of potential confusion within the group, priority was given to collecting *Jamides* specimens on islands where they were observed. It became clear that this material included species not previously recorded from the Santa Cruz Islands, as well as undescribed taxa. It proved difficult, if not impossible, to allocate all specimens collected to species or even in some cases to associate females with the correct males with any degree of certainty.

Without doubt, four *bochus*-group species were present: *J. amarauge* (see below), *J. cephion, J. morphoides* and *J. goodenovii* Butler (TL: Vanuatu: Espiritu Santo). Of these, *J. amarauge* was previously unknown east of the Solomons archipelago (San Cristobal) and both *J. morphoides* and *J. goodenovii* were not previously known from localities outside Vanuatu. Although it is believed that accumulated material probably includes further undescribed taxa, practical difficulties in separation preclude their description (with the exception of a new subspecies of *J. amarauge*) pending a thorough revision. All material collected has been deposited in The Natural History Museum (BMNH), London.

Jamides amarauge hepworthi subsp. nov.

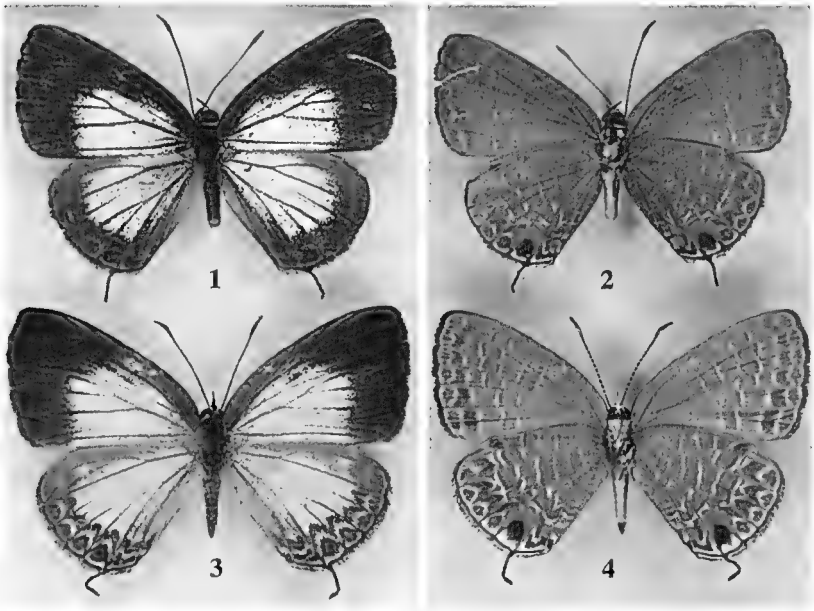
(Figs 1-4)

Types. Holotype ♂, SOLOMON ISLANDS: Santa Cruz group, Vanikoro, main island, Lale village, SL, 10.iv.2000, W.J. Tennent (gen. prep. BMNH(V) 5978) (BMNH). *Paratypes*: 2 ♂♂, same data as holotype; 2 ♂♂, same locality, 7.iv.2000; 1 ♂, 2 ♀♀, Nendo Island, Late to Luesalo (Graciosa Bay), SL, 4.v.2000, W.J. Tennent (♂ gen. prep. BMNH(V) 5977); 1 ♀, Nendo, Late to Noipe, 60-140 m, 9.v.2000, W.J. Tennent (all BMNH).

Description. Male (Figs 1-2) forewing length 12 mm; upperside superficially similar to nominotypical *J. a. amarauge* (Solomons archipelago); forewing basal half shining blue-green (*J. a. amarauge* blue with less green, slightly more extensive); borders dark brown, broad; hindwing basal two-thirds shining blue-green; marginal and submarginal markings largely obscured in most specimens, making border appear broader and darker (some submarginal markings usually prominent in *J. a. amarauge*); basal margin of this band more linear than in *J. a. amarauge*; underside similar to *J. a. amarauge*; lines less well defined (the male holotype of *J. a. amarauge* is atypical in this respect); hindwing subtornal spot smaller than in *J. a. amarauge*, leaving surrounding orange area prominent. Genitalia as in *J. a. amarauge*. The only male available from Nendo is larger and more green than males from Vanikoro. Female (Figs 3-4) similar to male, upperside colour less extensive than in male and pale gleaming blue; underside similar to male.

Etymology. This new taxon is named after Ross Hepworth, of Pigeon Island (Reef group), without whose marine skills and local knowledge, travel throughout the western Santa Cruz Islands in 2000 would have been virtually impossible.

Distribution. Santa Cruz group (Nendo and Vanikoro).



Figs 1-4. *Jamides amarauge hepworthi* subsp. nov. (1-2) male holotype: (1) upperside, (2) underside; (3-4) female paratype: (3) upperside, (4) underside.

Discussion

Although *J. amarauge* is part of the *bochus*-group of species, it is a distinctive butterfly, unlikely to be confused with other species of the group. Discovery of *J. amarauge* in the Santa Cruz group extends the known range of this species by almost 600 km to the east (San Cristobal [Kira-Kira] to Vanikoro).

Judging from several hundred *Jamides* genitalia preparations in the BMNH, London, G. E. Tite, who revised several lycaenid genera in the early 1960s (Tite 1959, 1963, 1966) considered undertaking a review of *Jamides* but, with the exception of the *euchylas* Hübner complex (Tite 1960), this was not carried out. *Jamides* remains one of the most complicated groups in the Polyommatini and has never been revised systematically (Hirowatari 1992).

Structure of the male genitalia, of fundamental value in identification of many lycaenid butterflies, is of limited value in the *bochus*-group. In particular, the shape of the valva, diagnostic in some other groups, is variable in *J. bochus* and its allies, consisting of a broad structure with an open, rounded posterior indentation somewhat variable in size. Valvae may be similar in species which are otherwise quite different in phenotype.

As already indicated, the genus *Jamides* is complex in the islands of Vanuatu, south of the Santa Cruz group and is in need of revision. It is noted that *J. morphoides*, recorded here for the first time from the Santa Cruz group, may be synonymous with *J. pulcherrima* Butler (TL: Vanuatu: Tanna) (Hirowatari 1992).

Acknowledgments

Mr Moses Biliki, Ministry of Forests, Environment and Conservation, Honiara, supported the author's research and the Ministry of Education and Human Resources Development, Honiara, issued permits for fieldwork. The fieldwork was partially funded by the Trustees of the Godman Exploration Fund (BMNH) and the Percy Sladen Fund (Linnean Society of London). Travel throughout the western Santa Cruz Islands would have been virtually impossible without the practical assistance of Ross Hepworth, business man and politician, of Pigeon Island (Reef group). The author is also grateful to village chiefs too numerous to mention individually who allowed research on 'Custom' land under their control. Chris Muller, Dural, NSW, kindly loaned the author an emergency radio beacon (EPIRB).

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A NEW SUBSPECIES OF *CANDALIDES HYACINTHINUS* (SEMPER) (LEPIDOPTERA: LYCAENIDAE) FROM WESTERN AUSTRALIA

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Abstract

Candalides hyacinthinus gilesi subsp. nov. is described from south-western Western Australia. The distribution, conservation status and information on the early life history of this new subspecies are recorded.

Introduction

For many years specimens resembling *Candalides hyacinthinus* (Semper) have been collected from the south-west of Western Australia. Following the treatment of Edwards and Kerr (1978), these had been referred to *C. h. hyacinthinus*. Subsequently, more extensive collections have revealed a suite of consistent differences between these specimens and typical *C. h. hyacinthinus* from eastern Australia. These differences warrant subspecific status for the Western Australian specimens.

Candalides hyacinthinus gilesi subsp. nov.

(Figs 1-4)

Types. *Holotype* ♂, WESTERN AUSTRALIA: Yalgorup NP, 17.xii.1992, M.R. Williams (in Western Australian Museum). *Paratypes*: 6 ♂, 2 ♀, Myalup, [H.H. Bollam], 2.xii.[19]90 (2♂), 21.xi.[19]91 (1♀), 26.xi.[19]91 (4♂), 29.xi.[19]91 (1♀); 3 ♀, L[ake] Preston, [H. Bollam], 25.xi.[19]85, 29.xi.[19]85, 16.xi.[19]87 (all in H.H. Bollam collection); 19 ♂, 11 ♀, Myalup, R. H[ay], 25.xi.[19]85 (1♂), 29.xi.[19]85 (1♂, 1♀), 17.xi.[19]87 (1♂), 25.xi.[19]87 (4♂, 2♀), 28.xi.[19]89 (2♂, 1♀), 2.xii.[19]90 (2♂, 2♀), 26.xi.[19]91 (3♂, 5♀), 1.xii.[19]92 (2♂), 17.xii.[19]92 (3♂); 5 ♂, 4 ♀, Manjedal, RH, 31.xii.[19]93 (all in R.W. Hay collection); 1 ♂, 2 ♀, Myalup, 1.xii.1990, M.R. Williams; 11 ♂, 2 ♀, Yalgorup NP, M.R. Williams, 26.xi.1991 (8♂, 2♀), 17.xii.1992 (3♂); 3 ♀, Manjedal Brook, 8.i.1993, M.R. Williams; 1 ♀, Manjedal Camp, 31.xii.1993, M.R. Williams (all in CALM collection, Kensington); 2 ♂, Windy Harbour, low dense coastal heath above cliffs, 34°50'13"S, 116°00'49"E, 28.x.1995, A.A.E. Williams; 1 ♂, 1 ♀, East of Yallingup, low open understorey in mixed jarrah/sheoak woodland, 30.xii.1995, A.A.E. Williams; 1 ♂, 2 ♀, Cosy Corner near Margaret River, dense mixed heathland on small hill adjacent to eucalypt woodland, 30.xii.1995, A.A.E. Williams; 5 ♂, 2 ♀, Manjedal Brook, Manjedal, Marri and jarrah forest, active around *Cassytha* sp, 4.i.1994, A.A.E. Williams; 5 ♂, 1 ♀, Yalgorup NP, M.R. Williams, 26.xi.1991 (1♂, 1♀), 17.xii.1992 (4♂); 1 ♀, Manjedal Brook, 8.i.1993, M.R. Williams (all in CALM collection, Woodvale).

Description. Male (Figs 1, 3). Head dark grey-brown; antennae black with white bands more prominent beneath; labial palpi black above, white beneath with light grey scales; eyes smooth. Thorax black above, light grey beneath; legs grey, suffused with light grey scales, tarsal segments ringed white. Abdomen dark grey-brown, light grey beneath.

Forewing above shining bronzy purplish-brown; apex dark brown; termen and costa narrowly dark brown; cilia dark brown, tipped white except at ends of veins. Forewing beneath grey-brown; a dark grey bar at end of cell; a narrow postmedian line of dark grey-brown dashes extending from R_5 to 1A+2A; subterminal line of dashes extending from R_5 to 1A+2A, that between M_3 and CuA_1 sometimes larger; those between CuA_1 and CuA_2, and CuA_2 and 1A+2A much larger; termen narrowly darker; cilia dark grey tipped white, except at ends of veins. Length of forewing 12-14.5 mm.

Hindwing above shining bronzy purplish-brown; termen narrowly dark brown; inner margin grey-brown and sparsely suffused with silvery hair scales; cilia dark brown tipped with white, except at ends of veins. Hindwing beneath grey-brown; two dark grey dots within cell, inner dot with a similar dot above it between $Sc+R_1$ and $Rs+M_1$, all three dots variably surrounded narrowly by white; median line of dark grey-brown dots and dashes, two at end of cell, one between $Sc+R_1$ and Rs directly above the distal dot in cell, one between CuA_1 and CuA_2, one between CuA_2 and 1A+2A, and one between 1A+2A and inner margin, dots nearest costa and the three nearest the inner margin narrowly edged by white; postmedian line of dark grey-brown dashes extending from $Sc+R_1$ to inner margin, bowed sharply inwards, those nearest costa and inner margin displaced proximally; subterminal line of black dashes, those between CuA_2 and $Sc+R_1$ bowed sharply inwards between veins, that nearest costa displaced proximally; terminal line of dark grey-brown dots; termen narrowly black; cilia dark grey-brown tipped white except at ends of veins; basal area sparsely suffused with silvery hair scales.

Genitalia with the spicule on the vesica usually shorter than in *C. h. hyacinthinus* (Edwards and Kerr 1978).

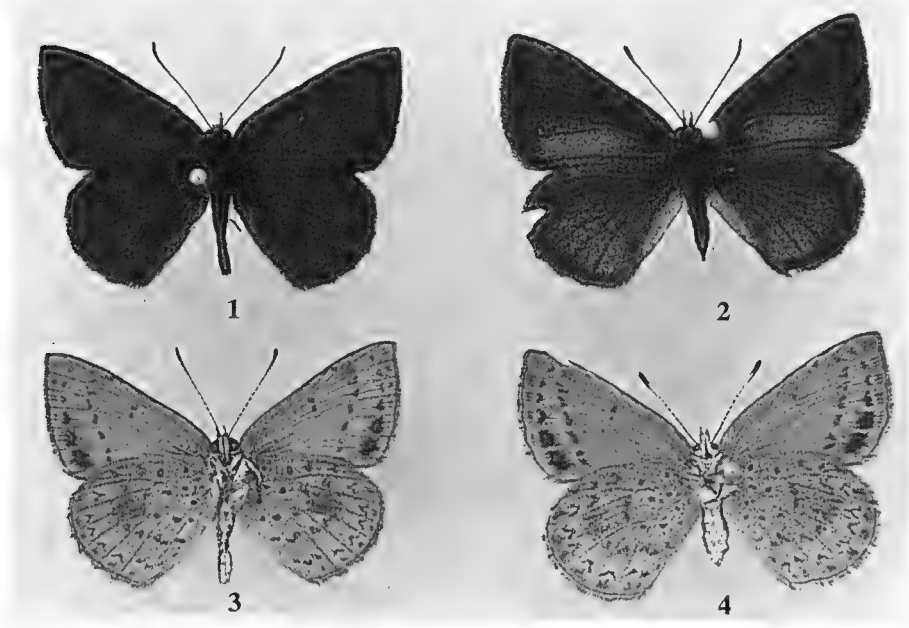
Female (Figs 2, 4). Head, thorax and abdomen as in male. Forewing above dark brown, shining purple between CuA_2 and inner margin except for terminal band and on veins, colour sometimes extending into cell and between CuA_2 and CuA_1, scattered blue scales at base. Forewing beneath as in male. Hindwing above dark brown, shining purple between M_1 and 1A+2A except for broad terminal band and on veins; basal half sparsely suffused with long silvery hair scales. Hindwing beneath as in male. Length of forewing 14-15 mm.

Etymology. The subspecific epithet commemorates Henry Murray Giles (*ca* 1857-1935), who collected the first known specimen of *C. h. gilesi* at Smiths Mill (now Glen Forrest), early this century.

Distribution. Specimens have been taken from south-western Western Australia, south of Perth, at the Porongurup Range, Manjimup, Warren River 6 miles (10 km) south east of Pemberton, Windy Harbour, Augusta,Karridale, Cosy Corner, Margaret River, near Yallingup, Glen Forrest (30 km east of Perth) (Edwards and Kerr 1978), Myalup (Dunn and Dunn 1991, Williams *et*

al. 1993), Dunsborough, Nornalup (Morton 1984), Manjedal Camp (Williams *et al.* 1993) and West Cape Howe (Williams *et al.* 1997).

Comments. C. h. gilesi may be distinguished from *C. h. hyacinthinus* by the following characters: Forewing shape: *C. h. gilesi* is characterized by a more acute apex to the forewing, a feature common to both sexes but particularly noticeable in females. Colour: males of *C. h. gilesi* have a more bronze cast to the wings above and the undersides of both sexes are darker brown. Narrower margin in males: the coloured areas above are more extensive in *C. h. gilesi* males, with a correspondingly narrower margin. Size: Tite (1963) gave the following ranges for forewing length for *C. h. hyacinthinus* (based on specimens from eastern Australia): males 14-17 mm, females 15-17 mm. Specimens of *C. h. gilesi* are typically smaller and we have seen no specimens of either sex with a forewing length greater than 15 mm. Postmedian line of dashes: this is roughly linear in *C. h. hyacinthinus*, but less so and more variable in *C. h. gilesi*.



Figs 1-4. *Candalides hyacinthinus gilesi* subsp. nov. (1) Upperside holotype male; (2) upperside paratype female; (3) underside paratype male; (4) underside paratype female.

Life History

Food plant. At Myalup and at Manjedal Brook the adults fly around *Cassytha racemosa* Nees (Lauraceae), a twining parasite (Marchant *et al.* 1987). Morton (1984) noted that at Nornalup and Dunsborough adults flew around an unspecified species of *Cassytha*. Specimens have been collected from October (Edwards and Kerr 1978) to late January although, based on our experience and the condition of specimens examined, the main flight period is late November to early January. This is the time of year when *C. racemosa* commences flowering. In December 1992 a female was observed ovipositing on the flower buds of *C. racemosa* and a first instar larva was collected from the same plant. This larva was reared to second instar on flower buds of *C. racemosa*. Two females caged with *C. racemosa* oviposited on the flower buds.

Egg. White, hemispherical but flattened, with micropylar region slightly depressed. As in other *Candalides* Hübner species, the egg is covered with a coarsely reticulate pattern of ridges, each with usually five or six sides. Diameter 0.6 mm.

First instar larva. Grey green, each body segment with two pairs of dorsal hairs and laterally fringed with three hairs, 0.25, 0.20 and 0.08 mm long. Each dorsal pair consists of a long clear recurved hair 0.35 ± 0.05 mm long and a clear, straight hair 0.10 mm long, oriented posteriorly. Prothoracic plate grey, almost semicircular. Anal plate grey, pear shaped. The body, prothoracic and anal plates are covered with minute brown spots. Length (excluding setae) 1.0 mm.

Second instar larva. Yellow green, each body segment with two pairs of dorsal hairs and laterally fringed with hairs. Each dorsal pair consists of a long brown recurved hair 0.45 ± 0.05 mm long and a clear, slightly recurved hair 0.25 ± 0.05 mm long, oriented posteriorly. Prothoracic plate yellow green, diamond shaped. Anal plate green, pear shaped. Abdominal segments 1-6 each with a red dorsal spot. The body, prothoracic and anal plates are covered with minute brown spots and ring-like spots. Length 1.8 mm.

Conservation status

Sites at the Porongurups and Myalup are within Porongurup and Yalgorup National Parks, respectively. The sites at West Cape Howe, Windy Harbour and Cosy Corner are within the West Cape Howe, D'Entrecasteaux and Leeuwin-Naturaliste National Parks respectively. The precise locality of the Nornalup site is unknown, but the Nornalup townsite is surrounded by the Walpole-Nornalup National Park. The Manjedal Camp site is on private property adjacent to State Forest. The precise localities of the sites at Dunsborough, Manjimup, Warren River, Augusta, Karridale, Margaret River and Glen Forrest are unknown. *Cassytha racemosa* is widespread in the south-west and the butterfly inhabits the well-conserved jarrah (and possibly

karri [*Eucalyptus diversicolor*]) forests. We consider it likely that many further sites where this butterfly occurs will be found. As no threatening processes have been identified, we recommend that *C. h. gilesi* be considered of Lower Risk (Least Concern).

Discussion

The new subspecies is closely allied to *C. h. hyacinthinus* and a summary of the distribution and taxonomy of this species is relevant to our subsequent discussions. *C. hyacinthinus* is distributed south from Exmouth, Western Australia, across much of southern Australia and as far north as Kuranda, Queensland. Distributional data and maps are given by Common and Waterhouse (1981), Dunn and Dunn (1991) and Braby (2000). Four subspecies have been described: *C. h. hyacinthinus* (Semper, 1879); *C. h. simplex* (Tepper, 1882); *C. h. eugenia* Waterhouse & Lyell, 1914 and *C. h. josephina* Harris, 1952. Dunn and Dunn (1991) and Braby (2000) both commented that the south-western form was a distinct subspecies. Edwards and Kerr (1978) considered *C. h. eugenia* to represent the northern end of a cline. Both Common and Waterhouse (1981) and D'Abrera (1984) noted that some specimens of *C. h. eugenia* were almost indistinguishable from typical *C. h. hyacinthinus*. Dunn and Dunn (1991) considered *C. h. eugenia* synonymous with *C. h. hyacinthinus*. *C. h. josephina* may represent a stable hybrid population between *C. h. hyacinthinus* and *C. h. simplex*, as it occurs only in a very restricted zone of contact between these two subspecies in eastern Victoria (Common and Waterhouse 1981). Although *C. h. hyacinthinus* and *C. h. simplex* are markedly different in upperside wing colouration, the male genitalia of the two subspecies are indistinguishable (Tite 1963). We have therefore restricted our comparisons to between the new subspecies and the two well-defined subspecies *C. h. hyacinthinus* and *C. h. simplex*.

The distributions of *C. h. gilesi* and *C. h. simplex* are generally distinct, although they may be sympatric in the Stirling or Porongurup Ranges and possibly at Margaret River. The Margaret River locality for *C. h. simplex* was reported by Edwards and Kerr (1978) and was based on a pencilled note by Dr A. J. Turner. Although subsequent authors (e.g. Common and Waterhouse 1981, Dunn and Dunn 1991) have generally dismissed this record, it may still be proved correct. Near Perth, specimens of *C. h. gilesi* and *C. h. simplex* have been taken about 40 km apart, at Glen Forrest and Fremantle. However, no specimens of *C. h. simplex* have been collected near Perth for many years. Although it is still possible that the two subspecies may yet be found together in this area, they tend to occupy different habitats, with *C. h. gilesi* being confined to forest or woodland in the north of its range, whereas *C. h. simplex* is typically found in heathland. Thus localities where the two species co-occur may prove to be limited to southern areas where *C. h. gilesi* occurs in heathland.

Acknowledgments

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TWO NEW SUBSPECIES OF *OGYRIS OTANES* C. & R. FELDER (LEPIDOPTERA: LYCAENIDAE) FROM WESTERN AUSTRALIA

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Abstract

Ogyris otanes sublustris subsp. nov. and *Ogyris otanes arcana* subsp. nov. are described from western coastal and southern Western Australia respectively. A lectotype is designated for *Ogyris otanes* C. & R. Felder. The new subspecies are compared with *O. otanes* from Kangaroo Island, South Australia and from near Yanac, western Victoria. The distribution, conservation status and life histories of the two new subspecies are reviewed.

Introduction

Waterhouse and Lyell (1914) recorded three specimens of *Ogyris* Angas from the Stirling Range, Western Australia, which they identified as *Ogyris otanes* C. & R. Felder, commenting that they were possibly a distinct subspecies. The Australian Museum Register and the labels on the specimens indicate that they were collected by F. L. Whitlock at the western end of the Stirling Range in October 1911. This population was rediscovered by Peter Valentine, Hugh Bollam and one of us (RWH) in 1988. Examination of additional specimens confirmed Waterhouse and Lyell's conjecture that specimens from this population could readily be distinguished from eastern Australian populations (Hay 1989).

In 1977 David Knowles discovered another population of *O. otanes* near Leeman, north of Perth (Hart and Powell 1997). This population was both geographically and morphologically distinct from that of the Stirling Range and even more distinct from eastern Australian populations of *O. otanes*. Dunn and Dunn (1991) referred to the Stirling Range and Leeman populations as local forms, suggesting that the two populations 'may be shown to be connected by isolated transitional forms'. They also observed that the distribution of the species in Western Australia was poorly documented. Subsequently, surveys reported by Field (1990), Williams *et al.* (1992, 1995, 1996) and Hart and Powell (1997) have better delineated the distribution of both forms and provided more specimens for examination. Braby (2000) recognised three distinct forms ('eastern', 'south-western' and 'western coastal') but did not formalise subspecific nomenclature.

We compared the two Western Australian forms with *O. otanes otanes* from Kangaroo Island, South Australia and from near Yanac, western Victoria (referred to as eastern Australian populations). The results of this examination show that although adults of both the Western Australian forms resemble *O. otanes* from eastern Australia, there are some striking and consistent differences both between the two Western Australian forms and in

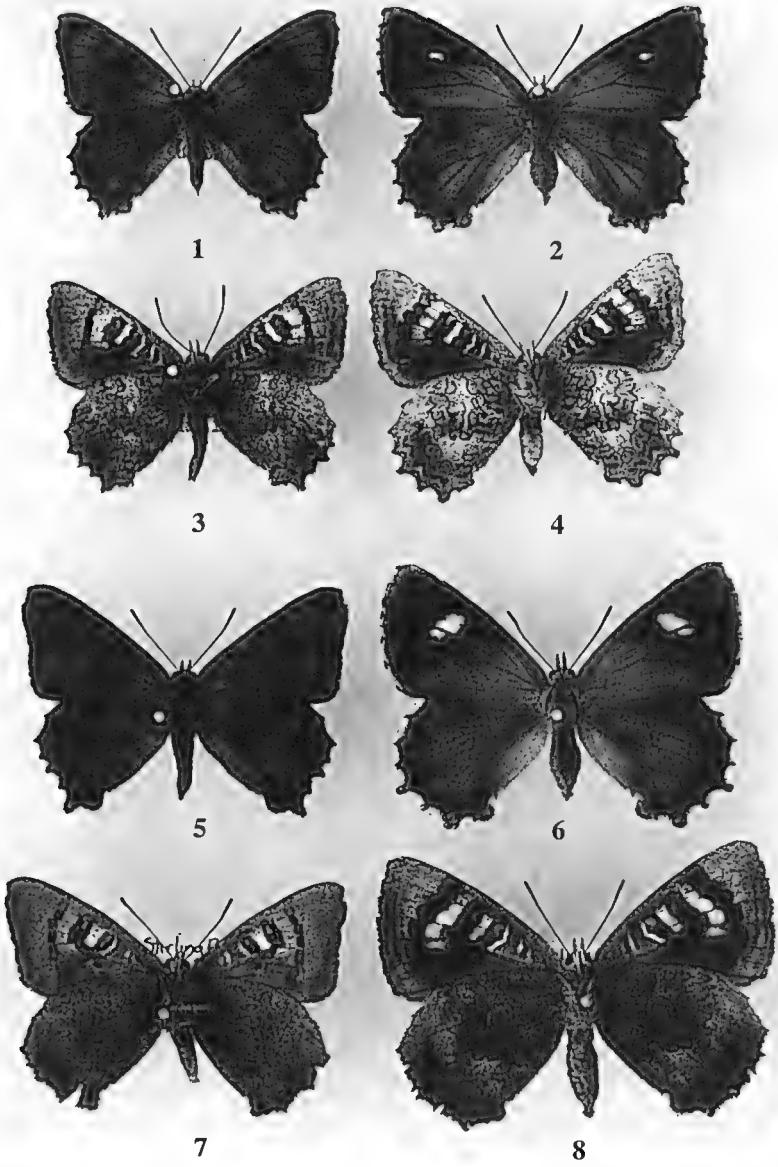
comparison to *O. otanes* from eastern Australia. These differences warrant subspecific status for each of the two Western Australian forms.

Ogyris otanes sublustris subsp. nov.

(Figs 1-4)

Types. *Holotype* ♂, WESTERN AUSTRALIA: Port Denison, 13.xi.1993, M.R. Williams (in Western Australian Museum). *Paratypes*: 1 ♂, 1 ♀, Leeman, ex p[upa], 2.xi.[19]87, R. H[ay], first ever Leeman *Ogyris* ex pupa; 3 ♂, 15 ♀, Leeman, ex p, R.H., 25.x.[19]88 (2♀), 26.x.[19]88 (1♀), 10.xi.[19]88 (1♀), 13.xi.[19]88 (1♀), 1.xii.[19]88 (1♀), 6.xi.[19]89 (1♂), 8.x.[19]90 (1♀), 29.x.[19]90 (1♂), 2.xi.[19]90 (1♀), 14.xi.[19]90 (1♂), 6.xi.[19]93 (2♀), 7.xi.[19]93 (1♀), 9.xi.[19]93 (1♀), 16.xi.[19]93 (3♀); 1 ♂, 1 km N of Leeman, 28.xii.1980, T.M.S. Hanlon; 5 ♂, 5 ♀, Leeman, 15.x.[19]85 (1♀), 16.x.[19]85 (1♂, 1♀), 17.x.[19]85 (2♂, 1♀), 23.ix.[19]87 (1♀), 8.ix.[19]88 (1♀), 28.ix.[19]89 (1♂), 26.ix.[19]90 (1♂); 5 ♂, 7 ♀, Port Denison, R.H., 24.ix.[19]92 (3♂, 2♀), 28.ix.[19]93 (2♀), 12.x.[19]94 (2♂, 3♀) (all in R.W. Hay collection); 6 ♂, 6 ♀, Leeman, [H.H. Bollam], 14.x.[19]85 (1♀), 15.x.[19]85 (2♂), 17.x.[19]86 (1♂), 4.xii.[19]86 (1♀), 9.ix.[19]88 (1♂), 15.x.[19]89 (1♂), 15.xi.[19]89 (1♀), 30.x.[19]90 (1♀), 1.xi.[19]90 (1♀), 2.xi.[19]90 (1♂), 7.xi.[19]90 (1♀), (all in H.H. Bollam collection); 11 ♀, as holotype but 6 dated 24.ix.1992, the remainder 28.ix.1992, 12.xi.1993, 13.xi.1993, 26.xi.1993 and 12.x.1994; 1 ♂, 2 ♀, 1 km S P[ort] Denison, 12.x.1994, M.R. Williams; 12 ♂, 21 ♀, Leeman, M.R. Williams, 25.ix.1990 (1♀), 27.x.1990 (1♀), 28.x.1990 (2♂, 1♀), 29.x.1990 (1♀), 1.xi.1990 (2♂, 1♀), 2.xi.1990 (2♂), 4.xi.1990 (1♀), 8.xi.1990 (1♀), 11.xi.1990 (1♀), 23.ix.1992 (2♂), 27.ix.1993 (2♀), 6.xi.1993 (1♂, 2♀), 9.xi.1993 (1♂, 3♀), 13.xi.1993 (2♀), 14.xi.1993 (1♀), 15.xi.1993 (1♂, 1♀), 16.xi.1993 (1♂, 2♀); 1 ♂, 2.6 km S of Lancelin, 31°02'S 115°21'E, 21.x.1997, M.R. Williams (all in CALM collection, Kensington); 1 ♂, 3 ♀, Port Denison, M.R. Williams, 14.xi.1993 (1♀), 15.xi.1993 (1♂), 20.xi.1993 (1♀), 21.xi.1993 (1♀); 1 ♂, 2 ♀, 1 km south of Dongara, sheltered area between vegetated secondary sand dunes just south of Dongara, 12.x.1994, A.A.E. Williams; 1 ♂, 10 ♀, 226 km north of Perth, Leeman, larval food plant *Leptomeria preissiana* at night, ant associated, A.A.E. Williams, 3.xi.1990 (1♀), 4.xi.1990 (1♀), 5.xi.1990 (2♀), 9.xi.1990 (1♀), 10.xi.1990 (1♂, 2♀), 11.xi.1990 (1♀), 20.xi.1990 (1♀), 23.xi.1990 (1♀); 3 ♂, 2 ♀, 226 km north of Perth, Leeman, flying along firebreak, very dense coastal scrub on limestone pavement, 26.ix.1990, A.A.E. Williams; 1 ♀, 2.6 km South of Lancelin, on near coastal dunes *Leptomeria preissii* [sic], 31°02.417'S 115°20.650'E, 21.x.1997, A.A.E. Williams (all in CALM collection, Woodvale).

Description. Male (Figs 1, 3). Head grey, vertex with mixed dark grey and white scales, frontoclypeus with two lateral and one median vertical bands of white scales with dark grey scales between; antennal shaft black ringed with white, six basal sections with two longitudinal black and white stripes, club expanding gradually from shaft; labial palpi pale grey consisting of scattered white and pale grey scales, terminal segment dark grey; eyes smooth. Thorax black above with pale grey hair scales becoming brown-grey anteriorly and posteriorly, beneath pale grey, legs pale grey consisting of mixed white and grey scales. Abdomen above grey consisting of dark grey and white scales mixed, whiter beneath.



Figs 1-8. *Ogyris otanes* subspecies. (1-4) *O. o. sublustris* subsp. nov. (1) Upperside holotype male; (2) upperside paratype female; (3) underside paratype male; (4) underside paratype female. (5-8) *O. o. arcana* subsp. nov. (5) upperside holotype male; (6) upperside paratype female; (7) underside paratype male; (8) underside paratype female.

Forewing costa convex near base then straight, apex sharply rounded, termen almost straight, slightly concave in middle; above brownish purple with a dark grey marginal band along termen, base of costa with coppery brown scales and some white and pale blue scales near apex, cilia white, dark grey at end of veins. Forewing beneath grey; apical half of wing heavily marked with white scales, from the base to just beyond the discal cell, a series of five transverse white bars, distal three bars enclosing median and postmedian bands of black, each centred with brilliant blue scales. Proximal two white bars enclosing a subcostal area of dark brown. Beyond the discal cell, a black bar extending from just below the costa to CuA_2, present below CuA_2 but dark brown and less distinct, a narrow subterminal line from well below apex to CuA_2, cilia grey tipped with white, grey at end of veins. Hindwing termen rounded and produced slightly at end of veins; tornus produced at end of CuA_2, anal lobe developed; above brownish-purple, costa and termen broadly dark grey; tornus and anal lobe with scattered white scales, cilia white, dark grey at ends of veins and towards costa and tornus, hair scales brown. Hindwing beneath pale grey; with complex pattern of lines and bars usual in *Ogyris*, lines dark grey, bars brown-grey, an area of suffused grey and brown towards termen, cilia white. Length of forewing 17-20 mm.

Genitalia. Uncus slightly peaked, tip depressed, posterior margin very slightly concave above and more sharply convex below middle; valva bilobed, short; aedeagus simple (E. D. Edwards, pers. comm.).

Female (Figs 2, 4). Head, thorax and abdomen as in male. Forewing costa slightly convex at base then slightly rounded; termen rounded. Forewing above with subcostal areas grey-brown, basal third of costal half of wing and basal two thirds of dorsal half of wing bright purple suffused with some brown scales; apex with scattered white scales. A series of three pale yellow-white spots just beyond end of cell, extending from M_1 to CuA_1, ground colour separating spots along M_3 and M_2, with spots below M_1 and M_3 much smaller than that below M_2 and sometimes absent. Cilia white, dark grey at tips of veins. Forewing beneath as in male but area between black bars beyond cell between M_1 and CuA_1 pale cream with veins pale grey. Hindwing with termen rounded, produced at end of veins, most strongly on M_3 and CuA_2. Anal lobe present; above dark grey forming a broad marginal band; central area bright purple, area around end of cell dark grey; hair scales brown; anal area pale grey, tornus with scattered white and blue scales, cilia white, dark grey at tips of veins. Hindwing beneath as in male but paler, a dark grey and brown suffusion in centre of wing. Length of forewing 16-20 mm.

Etymology. The subspecific name *sublustris* means darkling or less than brilliant and refers in particular to the colour of the upperside of the male.

Larval food plant. *Leptomeria preissiana* (Santalaceae).

Distribution. Ogyris otanes sublustris occurs from 3 km S of Lancelin to 1 km S of Port Denison (between 110 and 320 km N of Perth; Hart and Powell 1997, Williams *et al.* 1995). It is restricted to areas within about 5 km of the coast. Within this general area four apparently disjunct populations are known: (1) within a narrow strip approx 1-2 km S of Port Denison, between the townsite and the airport on the landward side of the fore dunes; (2) from a number of localities between 5 km north and 7 km south of the Leeman townsite; (3) 16 km N of Jurien Bay; and (4) between 1 and 3 km S of Lancelin.

Ogyris otanes arcana subsp. nov.

(Figs. 5-8)

Types. Holotype ♂, WESTERN AUSTRALIA: Stirling Ra[nge], 7.xii.1990, M.R. Williams (in Western Australian Museum). *Paratypes*: 11 ♂, 11 ♀, as holotype but dated 6.xi.1990 (2♂), 7.xi.1990 (3♂, 4♀), 9.xi.1990 (1♀), 30.xi.1990 (1♂), 1.xii.1990 (1♂), 3.xii.1990 (1♂, 1♀), 5.xii.1990 (1♀), 6.xii.1990 (1♂), 7.xii.1990 (1♀), 8.xii.1990 (1♂, 3♀), 10.xii.1990 (1♂); 2 ♂, 2 ♀, Stirling Ra. NP, ex pupa, M.R. Williams, 2.xii.1991 (2♂, 1♀), 12.xii.1991 (1♀); 1 ♂, 2 ♀, Stirling Ra. NP, ex *C. glomeratum*, 21.xi.1991 (1♀), 25.xi.1991 (1♂), 27.xi.1991 (1♀), M.R. Williams; 3 ♂, 1 ♀, Stirling Ra., e[x] p[upa], M.R. Williams, 4.xii.1993 (1♂, 1♀), 5.xii.1993 (2♂); 3 ♀, Cape Arid NP, ep, M.R. Williams, 6.xii.1994, 12.xii.1994 and 17.xii.1994; 1 ♀, Cape Arid NP, 33°32'42"S 123°31'22"E, ep 3.xii.1994, M.R. Williams (all in CALM collection, Kensington); 5 ♂, 9 ♀, Stirling Range, larva, ex p, R. H[ay], 5.xi.[19]88 (1♂, 1♀), 30.xi.[19]88 (1♂, 1♀), 1.xii.[19]88 (1♀), 2.xii.[19]88 (1♂), 8.xii.[19]88 (1♀), 8.xii.[19]90 (1♀), 12.xii.[19]90 (1♀), 17.xii.[19]90 (1♀), 14.xii.[19]93 (1♂), 16.xii.[19]93 (1♀), 22.xii.[19]93 (1♀), 25.xii.[19]93 (1♂); 6 ♂, 8 ♀, larva ex Wylie Scarp, reared ex p, R.W.H., 21.xi.[19]91 (2♀), 22.xi.[19]91 (2♂, 1♀), 24.xi.[19]91 (2♂), 26.xi.[19]91 (1♀), 27.xi.[19]91 (1♀), 28.xi.[19]91 (1♂, 1♀), 2.xii.[19]91 (1♀), 4.xii.[19]91 (1♀), 5.xii.[19]91 (1♂); 1 ♂, Stirling Ra, R.H., 2.xi.[19]88 (all in R.W. Hay collection); 6 ♂, 5 ♀, Stirling R[ange], [H.H. Bollam], 19.xi.[19]88 (1♂), 30.xi.[19]88 (1♂, 2♀), 5.xii.[19]88 (2♀), 5.i.[19]89 (1♂), 8.i.[19]89 (1♀), 12.iii.[19]89 (1♂), 2.xi.[19]89 (1♂), 13.xi.[19]89 (1♂), (all in H.H. Bollam collection); 3 ♂, 3 ♀, Stirling Range Nat. Park, ex pupa, larvae attended by ants on *Choretrum glomeratum* shrubs (MRW), A.A.E. Williams, 13.xi.1991 (1♀), 15.xi.1991 (1♂), 17.xi.1991 (1♀), 21.xi.1991 (1♂), 22.xi.1991 (1♂), 24.xi.1991 (1♀); 1 ♂, Stirling Range Nat Park, 1.8 km SW Mt Gog, scenic hilltop lookout with mixed low mallee and heath vegetation, 27.i.1994, A.A.E. Williams; 1 ♂, Stirling Range Nat. Park, Salt River Rd 5.3 km east of Red Gum Pass Road junction, 4.xi.1997, A.A.E. Williams; 1 ♂, Cape Arid National Park, Gora Road, old burnt mallee scrub habitat on Gora Road, 33°32'42"S 123°31'22"E, 6.xi.1994, A.A.E. Williams; 1 ♀, Cape Arid National Park, Gora Road, ex pupa from ants' nest at base of food plant, 22.xii.1994, A.A.E. Williams (all in CALM collection, Woodvale).

Description. Male (Figs 5, 7). Head grey, vertex with dark grey and white scales, frontoclypeus with two lateral and one median vertical bands of white scales with dark grey scales between; antennal shaft black ringed with grey, club expanding gradually from shaft; labial palpi pale grey consisting of scattered white and pale grey scales, terminal segment dark grey; eyes

smooth. Thorax black above with brown-grey hair scales becoming brown anteriorly and posteriorly, beneath grey, legs pale grey consisting of mixed white and grey scales. Abdomen above dark grey consisting of dark grey and grey scales mixed, lighter beneath.

Forewing costa convex near base then straight, apex sharply rounded, termen almost straight, slightly concave in middle; above deep brownish purple with basal areas dusted blue, dark grey marginal band along termen, base of costa with brown scales, cilia grey, dark grey at end of veins. Forewing beneath grey-brown; apical half of wing marked with light grey scales; from the base to just beyond the discal cell a series of five transverse light coloured bars, the basal two white, the next two light blue and the final postmedian bar light brown to light grey. Distal three bars enclosing median and postmedian bands of black, each centred with brilliant blue or blue-purple scales. Proximal two white bars enclosing a subcostal area of dark brown. Beyond the discal cell a black bar extending from just below the costa to CuA_2, present below CuA_2 but dark brown and less distinct, cilia grey, dark grey at end of veins. Hindwing termen rounded and produced slightly at end of veins; tornus produced at end of CuA_2; anal lobe developed; above brownish-purple, costa and termen broadly dark grey; cilia grey, dark grey at ends of veins and towards costa and tornus, hair scales brown. Hindwing beneath dark grey with very obscure pattern of dark brown bars, an area of suffused coppery brown towards termen, cilia grey. Length of forewing 18-22 mm.

Female (Figs 6, 8). Head, thorax and abdomen as in male. Forewing costa slightly convex at base then slightly rounded; termen rounded. Forewing above with subcostal areas grey-brown, basal half of costal half of wing and basal three-quarters of dorsal half of wing bright purple or bluish-purple, suffused with some brown scales. A series of three pale yellow-white spots just beyond end of cell, extending from M_1 to CuA_1, the spots below M_1 and M_2 fused, that below M_2 separate, smaller and sometimes absent, occasionally a fourth yellow-white spot between CuA_1 and CuA_2. Cilia grey, dark grey at tips of veins. Forewing beneath as in male but black bands broader, a yellow band between M_1 and CuA_2 beyond the discal cell replacing the light brown or grey band in males. Hindwing with termen rounded, produced at end of veins, most strongly on M_3 and CuA_2. Anal lobe present; above dark grey forming a broad marginal band, basal two-thirds bright purple or bluish-purple, area around end of cell dark grey, hair scales brown; anal area light brown; tornus with scattered grey and blue scales, cilia grey, dark grey at tips of veins. Hindwing beneath as in male but lighter with markings more distinct. Length of forewing 19-24 mm.

Etymology. The subspecific name *arcana* means lost or hidden and refers to the long period between the initial discovery by Whitlock and the eventual rediscovery.

Larval food plant. *Choretrum glomeratum* (Santalaceae).

Distribution. Specimens have been collected at a number of sites in the Stirling Range National Park and the adjacent Camel Lake Nature Reserve, in Cape Arid National Park and the adjacent Nuytsland Nature Reserve, and at Israelite Bay (Max Moulds, pers. comm.). Two specimens taken at Pink Lake near Esperance by Ross Field may belong here but have been excluded from the type series. Field (1987) believed these two specimens, both males, to be more closely allied to *O. o. sublustris*, although he noted two characters (more extensive blue bands on the underside of the forewing and narrower dark brown bands beneath) that suggest alliance to *O. o. arcana*. Until further material, particularly females, is available from this site, there is little point conjecturing on the significance or taxonomic status of these two specimens.

Conservation status

Ogyris o. sublustris occurs in four apparently disjunct populations within a restricted coastal strip between Lancelin and Port Denison (Williams *et al.* 1995, Hart and Powell 1997). The Port Denison site in particular and parts of the Leeman site are threatened by urban expansion. The sites to the south of Lancelin and around Leeman are within town and Shire reserves and may be similarly threatened in future. The site north of Jurien Bay and part of the site around Leeman are within the Beekeeper's Nature Reserve. Hart and Powell (1997) suggested that *O. o. sublustris* may occur further north or south of the current distribution, in sites further inland, or in a number of nature reserves in the area, but there is no evidence to support any of these conjectures. Surveys conducted in this region by us and others, including Hugh Bollam, Paul Hutchinson, Trevor Lundstrom and Andy Williams, plus a survey by Grant Miller (pers. comm.), who collected at a site 14 km N of Dongara in 1974, failed to locate any new sites for *O. o. sublustris*.

The future of the site at Port Denison, where *O. o. sublustris* flies together with *O. idmo* Hewitson, is of particular concern. This is the only site known where both these species fly together and it is also the northernmost limit for both species. Some morphological differences have also been noted for both species at this site (Williams *et al.* 1995).

We recommend that *O. o. sublustris* be considered Vulnerable; the threatening process is clearing of habitat as a result of increasing urbanisation and development of coastal areas. Better knowledge of the extent of its occurrence within conservation reserves is needed, as well as additional information on appropriate management of its restricted habitat.

O. o. arcana occurs across a wide area of southern Western Australia and at a number of sites within two major National Parks. Although there is some evidence of displacement from previously utilised sites by *Hypochrysops ignitus* (Leach) (pers. obs.), this does not appear to be a threat. However, further monitoring of the processes involved would be of value and better knowledge of appropriate management of this taxon is needed. In the absence

of any known threatening process, we recommend that this taxon be considered Lower Risk (Least Concern).

Discussion

Ogyris otanes was described from more than one specimen as both sexes were illustrated and described. A male from the Felder collection, now in The Natural History Museum, London (BMNH), labelled 'Austral. Merid. Adelaide Angas, *Ogyris otanes* Feld., Type, Felder Colln, *otanes* n' is hereby designated as the lectotype.

Females of *O. o. sublustris* are easily distinguished from *O. o. otanes* and *O. o. arcana* by the much reduced pale yellow spot on the forewing. The purple areas on the upperside of both wings are reduced, often with ground colour along the veins, and are more heavily dusted with brown scales. Females of *O. o. sublustris* also have a more pointed apex and a slightly more produced tornus of the hindwing. In males, the subterminal band on the underside of the forewing is prominent. Both sexes of *O. o. sublustris* are characterised by lighter colour overall than *O. o. arcana*, with grey scales at the apex of the forewing above and on the projections of the hindwing tails above and a generally lighter ground colour below. The cilia edging the wings are also much lighter. This subspecies is also smaller in size than *O. o. arcana* and *O. o. otanes*, with forewing lengths for males 17-20 mm and females 16-20 mm. The food plant of *O. o. sublustris* is *Leptomeria preissiana*, wheras the food plant of both *O. o. otanes* and *O. o. arcana* is *Choretrum glomeratum* (both Santalaceae).

In *O. o. arcana* the undersides of both sexes, but particularly males, are so dark that the cryptic markings are largely obscured. The uppersides of *O. o. arcana* females are similar to eastern females of *O. o. otanes*.

O. o. sublustris and *O. o. arcana* differ from *O. o. otanes* in having a more acute apex and a straighter termen to the forewing. Both sexes also have a slightly narrower hindwing and the projection from vein CuA_2 and the anal lobe is more accentuated. Males of both *O. o. sublustris* and *O. o. arcana* are much darker than eastern populations. The undersides of both sexes are darker and have a distinct grey colour that contrasts markedly with the brown colour of eastern populations.

Acknowledgments

We thank Ted Edwards for undertaking examinations of the Western Australian populations and for preparing the initial drafts on which this paper is based; Hugh Bollam and Andy Williams for field assistance, access to specimens in their care and comments on the draft manuscript; Andrew Atkins for examining the early stages and for assistance in preparing the manuscript; and David Knowles, Peter Valentine, Max Moulds, Mike Powell and Ross Field for distributional records and field observations.

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BOOK REVIEW

Hymenoptera: Evolution, Biodiversity and Biological Control. Editors: Andrew D. Austin & Mark Dowton. CSIRO Publishing; October 2000; xi + 468 pp; hardback. Price $165. ISBN 0 643 06610 1

The Hymenoptera is one of the largest and most important groups of insects, and this volume originates from papers presented at the Fourth International Conference of the International Society of Hymenopterists, held in Canberra in January 1999. This conference is a quadrennial event that brings specialists in all fields of Hymenoptera study together to present their research results. The volume contains about 4/5 of the papers presented at the conference. A few papers were lost either through the presenters desire to publish them elsewhere or because they did not live up to the fairly strict standards imposed by the editors. The papers were subjected to a critical referee and editing process, so that many of the papers underwent substantial change between the Conference and the final versions presented in the volume.

The aim of the volume was to present an up-to-date account of current research in Hymenoptera. It is quite useful to see volumes like this appear every so often, as they present a slice in time of the research advances that are taking place across the field. One of the hopes of the editors was that this volume, by presenting this up-to-date overview, would stimulate interest in Hymenoptera as a whole, as well as promote interaction and synthesis between workers in different areas of Hymenoptera studies.

The volume presents 49 papers by 116 authors, plus an introductory and closing chapter produced by the editors. These papers fall into eight broad subject areas: development and physiology (7 papers), molecular phylogenetics (8 papers), systematics (10 papers), biology, ecology, behaviour (7 papers), biodiversity, (5 papers), biological control (10 papers), Hymenoptera in education (1 paper), medical effects of Hymenoptera (1 paper).

This volume has all the expected good and bad points of any conference proceedings volume. The positive side is that it presents a broad and up-to-date overview of current research trends in Hymenoptera, and it includes chapters by many of the world's leading hymenopterists. The volume covers a wide variety of topics, and the editors have put time and effort into maintaining high quality in the included papers. Indeed, some of the papers are a bit above average of those found in proceedings volumes, and could easily have found homes in mainline journals. As such, it should achieve some of the editors' goals of stimulating interest and a synthesis of ideas.

The negative side is that this, like most conference volumes, lacks the focus and depth that you would find in a volume tailored to treat a specific subject and with authors selected whether they chose to attend a conference or not. Some interesting subjects are treated only in passing, and others are omitted entirely. Conference volumes also tend to lack a sense of uniformity in quality of treatment, despite the best efforts of the editors. Finally, because they are meant to represent an overview at a given time rather than an in-depth treatment of a given discipline, they become outdated more rapidly.

The question people will have to ask themselves is whether this volume is worth the $165 to put it on their bookshelves. I would like to think that many will find it worth the money, including serious students of Hymenoptera and libraries in research institutions. I find that I have already used my copy on several occasions to look up papers of specific interest, or just to have a browse through it to see what has been happening in a fascinating field of study.

John LaSalle

NOTES FOR AUTHORS

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